

Sustainability, Innovation, and the Future of Environmental Protection

Paul Anastas, Ph.D.
Assistant Administrator
Office of Research and Development
U.S. Environmental Protection Agency



Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE SEP 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Sustainability, Innovation, and the Future of Environmental Protection				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Environmental Protection Agency, Office of Research and Development, 109 Alexander Drive, Durham, NC, 27711				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the 15th Annual Partners in Environmental Technology Technical Symposium & Workshop, 30 Nov ? 2 Dec 2010, Washington, DC. Sponsored by SERDP and ESTCP.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 30	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



U.S. EPA and the Office of Research and Development (ORD)



The EPA Administrator's Guiding Principles and Priorities

Guiding Principles

- Science must be the backbone for EPA programs.
- EPA must follow the rule of law.
- EPA's actions must be transparent.

Priorities

- Improving Air Quality
- Assuring the Safety of Chemicals
- Cleaning Up Our Communities
- Protecting America's Waters
- Taking Action on Climate Change
- Building Strong State and Tribal Partnerships
- Expanding the Conversation on Environmentalism and Working for Environmental Justice

EPA/ORD and DoD/SERDP
have complementary research agendas for
sustainability, health, and environment
protection.

Complementary EPA/DoD Research

- Energy sustainability
 - Alternative energy sources
 - energy security for the military (and the country)
 - less pollution, exposure
 - less international vulnerability
- Worker exposure
 - Protecting soldiers' health is similar to protecting civilian workers' health
 - E.g., off-road diesels and PM emissions, open burning of trash at forward bases
- Global climate
 - Coastal infrastructure is vulnerable to sea level changes

Complementary EPA/DoD Research (contin.)

- Materials sustainability
 - Trace metals
 - Security of supply chain
 - Appropriate selection and use
 - Mass balance on use, reuse, and recovery
 - Persistent organics
 - Identification, fate, effects
 - Substitutes



Air Quality. ORD/SERDP Collaboration: Sampling Open Detonations of Military Ordnance (TNT) to Determine Emissions

An aerostat-lofted sampling instrument was developed by EPA under a SERDP project to measure emissions from open burning and open detonation of military ordnance.

Aerostat





Air Quality. EPA/U.S. AFRL/et al. Aircraft Testing

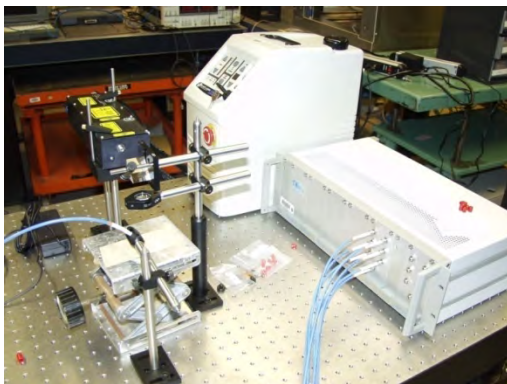




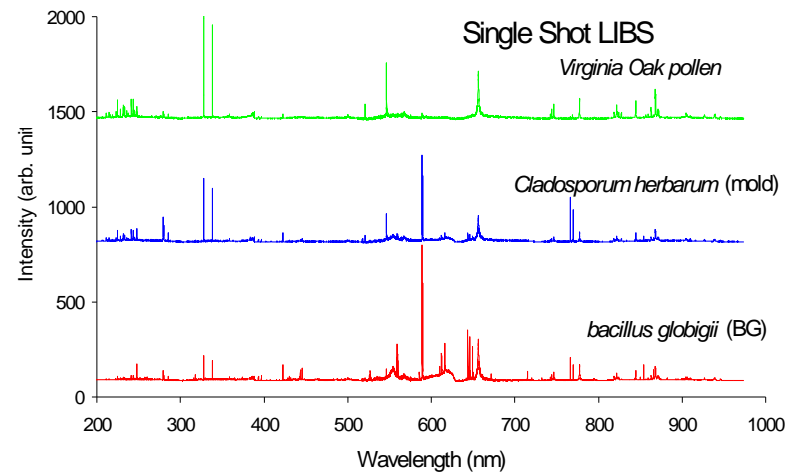
Protecting America's Waters. EPA/USAF/UF Project Predicting DNAPL Source Zone and Plume



ORD/SERDP Collaboration: Development of Laser Induced Breakdown Spectroscopy (LIBS) for spore detection and explosives detection



Laboratory LIBS



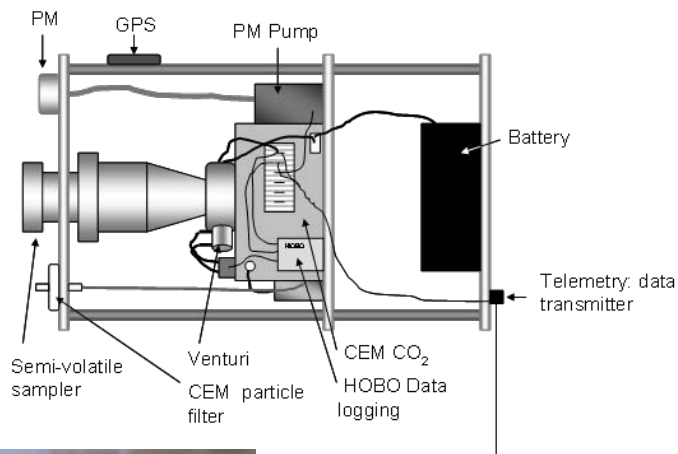
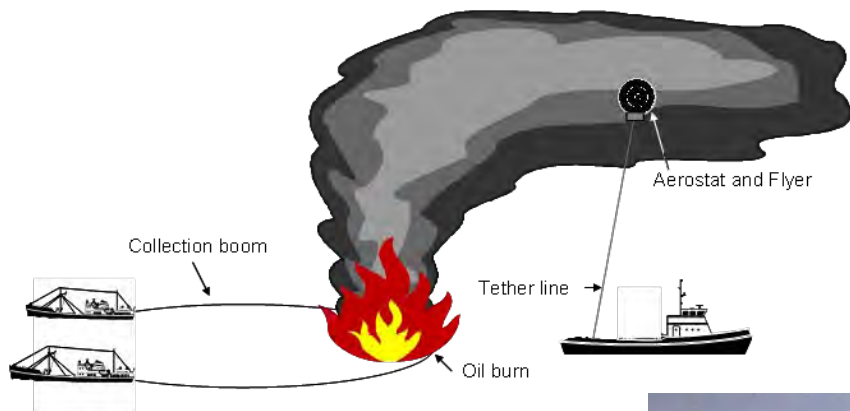
LIBS Unique spectra fingerprints of *Bacillus subtilis* (a surrogate for *B. anthracis*)



Man-portable LIBS



Sampling for Dioxins at the Gulf in situ oil burns with the EPA/SERDP Aerostat/Flyer





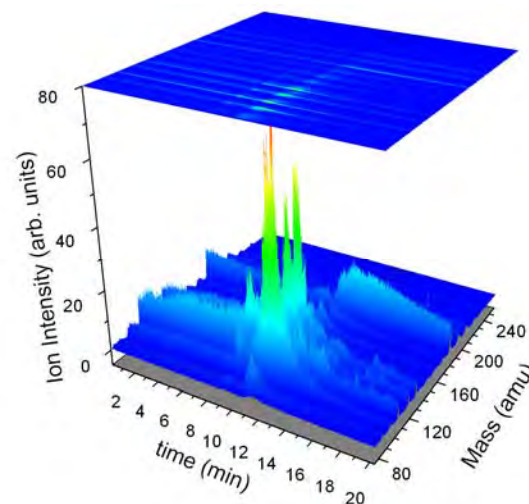
EPA/SERDP Development of a Trace Organic Monitor



REMPI-TOFMS:
Resonance-Enhanced
Multiphoton Ionization – Time of
Flight Mass Spectrometry, a
sensitive, selective, and real-time
aromatic monitor



Field test at RDF Waste-to-Energy Facility

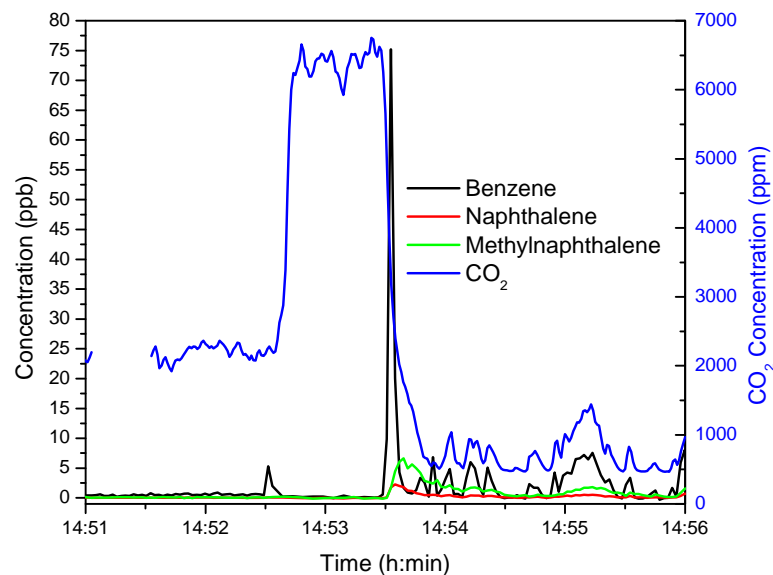


Start-up emission profile



EPA/SERDP Project: Real time detection of trace aromatics

Tyndall AFB, F15/F22



**A project with the U.S. Air Force
Research Laboratory**





EPA/SERDP Project: Emission/Performance Testing at Aberdeen Test Center

High Mobility Multipurpose Wheeled Vehicle (HMMWV) vehicles tested on a chassis dynamometer



Stationary M1A2 and Bradley engine monitoring



Office of Research and Development

A project with the U.S. Army, Aberdeen Test Center



EPA/USAFIT Project: Monitoring and Characterization of Emissions from Burn Pits in Forward Operating Bases

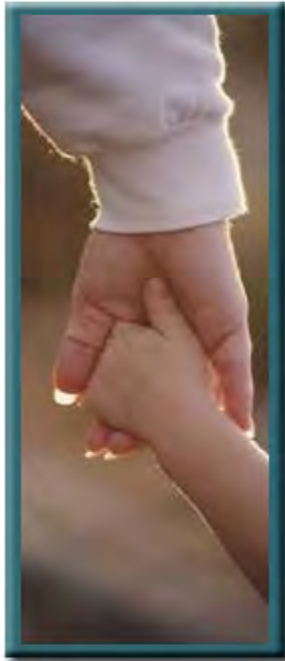




Mission of EPA's Office of Research and Development (ORD)

Provide the scientific foundation to support the EPA's mission by:

- **Conducting research and development** to identify, understand, and solve current and future environmental problems
- **Providing responsive technical support** to EPA's Programs and Regions
- **Collaborating with our scientific partners** in academia and other agencies, private-sector organizations, state and tribal governments, and other nations
- **Exercising leadership** in addressing emerging environmental issues and advancing the science and technology of risk assessment and risk management

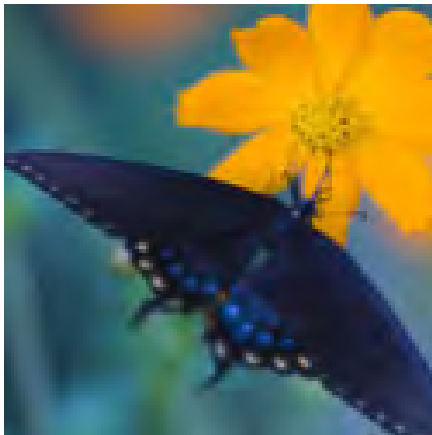
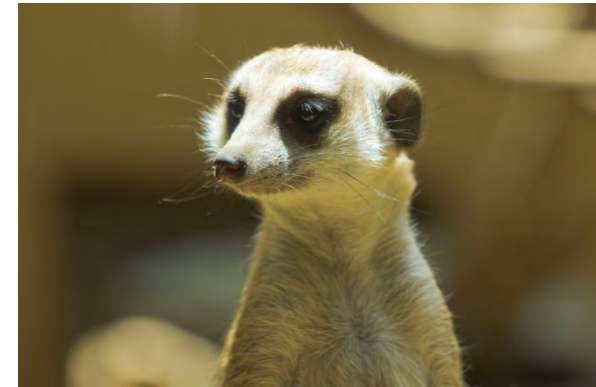


Sustainability Innovation Transdisciplinary Collaboration

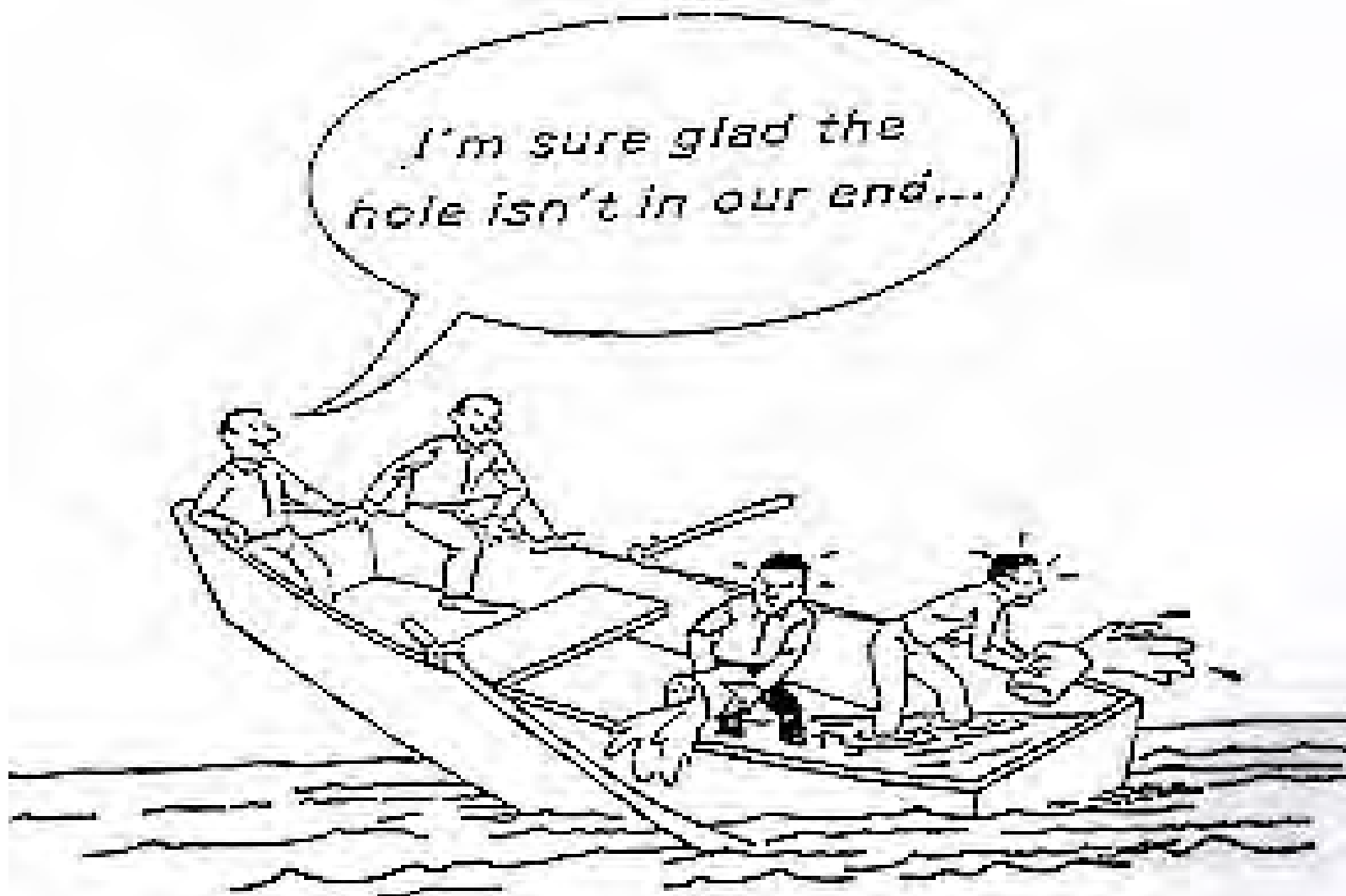


Scientific Values for the Path Forward

- Sustainability
 - True North
 - Safety by Design
- Transdisciplinary Collaboration and Integrative Systems
- Innovation and Catalysis



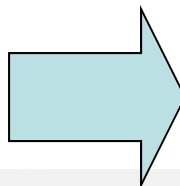
Design for a Systems Context



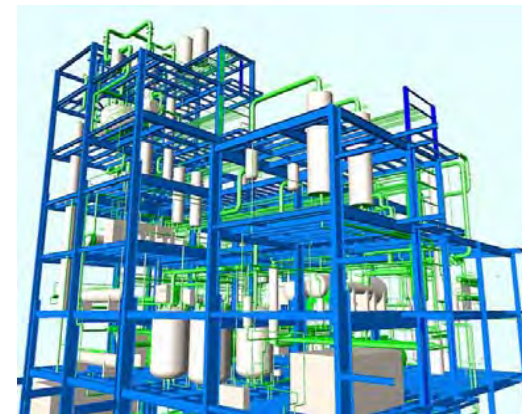
Sustainability, & chemical product design



**Coffee decaffeination using
methylene chloride**



Coffee beans without caffeine



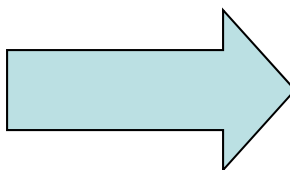
**Coffee decaffeination
using
CO₂ (not a “solvent” by
FDA)**

Sustainability & chemical product design

The task is the cleaning of clothes; current product is detergent.



Detergent



**Self-cleaning
clothes?**



**Concentrated
detergent**

Desired Outcomes & System Definition



**Our company makes
lawnmowers; we decide
the consumer wants a
greener lawnmower...**

Ideas:

**Quieter mower
More fuel efficient
Runs on waste corn oil
Solar powered**



Look at the system and desired outcome

Taking step back....desired customer outcome is grass of certain height.....no-mow grass....*eliminate the mower entirely.*



Current ORD Research Activities and Strategic Directions.



Improving Air Quality

Vision: *EPA science will provide the fundamental knowledge needed to appropriately address air-quality issues with innovative and strategic solutions.*

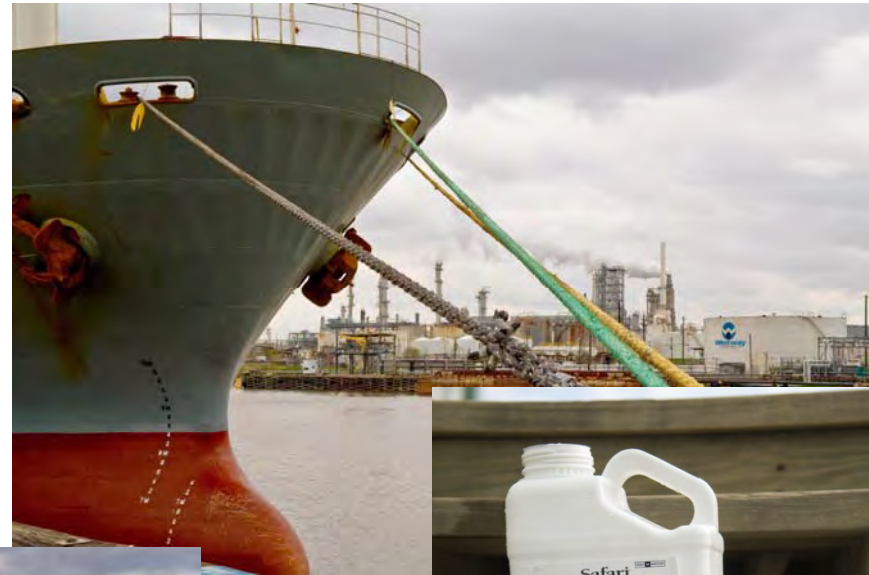


Examples of Current ORD Activity



Assuring the Safety of Chemicals

Vision: *EPA science will lead the sustainable development, use, and assessment of chemicals.*



Examples of Current ORD Activity



Cleaning Up Our Communities

Vision: *Expand interactions between restoration, sustainable materials management, and land-use research strategies to apply scientific tools and support sustainable community decisions.*



Examples of Current ORD Activity





Protecting America's Waters

Vision: *ORD will develop a "one hydrosphere" approach to conducting science and technology research that leads to the development of safe, resilient, and sustainable water resources.*



Examples of Current ORD Activity



Taking Action on Climate Change

Vision: *ORD will be a key source for Program and Regional Offices on climate change impacts, adaptation, and mitigation research.*



Examples of Current ORD Activity

THANK YOU!

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